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METHOD OF METERING THE WATER SUPPLIED TO THE
FIVE DISTRIBUTION SYSTEMS OF THE CITY OF
NEWARK, N. J.

BY GEORGE SANZENBACHER¹

There has recently been completed at Newark, N. J., a unique structure, figure 1, serving the dual purpose of a memorial to one of the city's most efficient former officials and a shelter for the apparatus which keeps a continuous automatic record of the quantity of water supplied to each of the five service districts.

The supply for the city comes from impounding reservoirs on the Pequannock watershed about 25 miles to the northwest. The original works furnished this supply through a 48-inch and a 42-inch riveted steel conduit, connected with two distributing reservoirs in the city, called the Belleville and South Orange Avenue reservoirs. About fifteen years ago the city built a storage reservoir holding 700,000,000 gallons at Cedar Grove, 7 miles from the city, in order to have a supply near at hand in case an accident happened to the riveted steel conduits. This reservoir is supplied through a 60-inch riveted steel conduit which is connected with the 42-inch and 48-inch conduits at Great Notch, a little less than a mile from Cedar Grove. From this storage reservoir a 60-inch riveted steel conduit was laid to the city. There is a Venturi meter on both the 42-inch and 48-inch conduits in the Pequannock watershed and one on the 60-inch conduit at Cedar Grove. Until the gauging devices described in this article were put in service, these three Venturi meters gave all the information that was available concerning the total quantity of water supplied to the city and the surrounding districts obtaining supplies from Newark.

The connections at Great Notch and Cedar Grove are so arranged that all of the supply for the city may be sent through the storage reservoir, which is the usual operating condition, or part may go to the reservoir and part to the city, or the water sent to the reservoir

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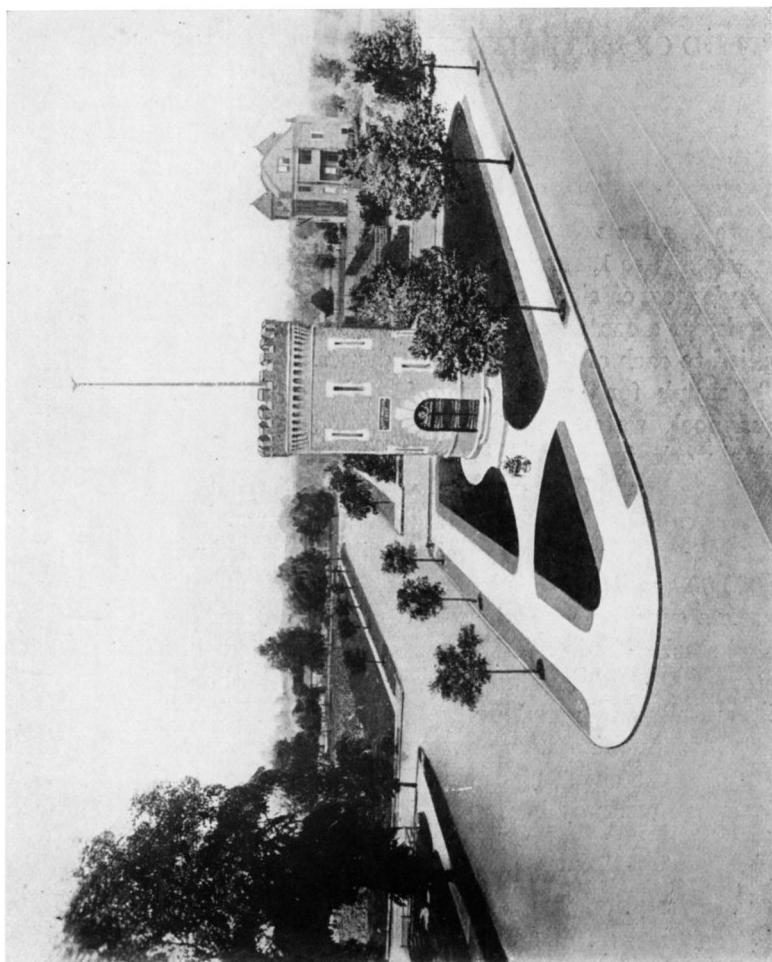


FIG. 1. MEMORIAL TOWER AND METER STATION, NEWARK WATER WORKS

may be by-passed there into the 60-inch conduit without going into storage.

Under the usual operating conditions, the supply for the entire city passes through the 60-inch conduit to the intersection of Bloomfield Avenue and North Sixth Street, at the point marked "Tower" in figure 3 and shown in detail in figure 2. Here there is a multiple header connection with a 36-inch cast iron main supplying a small district numbered 5 on figure 3 and called locally the Silver Lake district, a header connection to a 36-inch cast iron main supplying

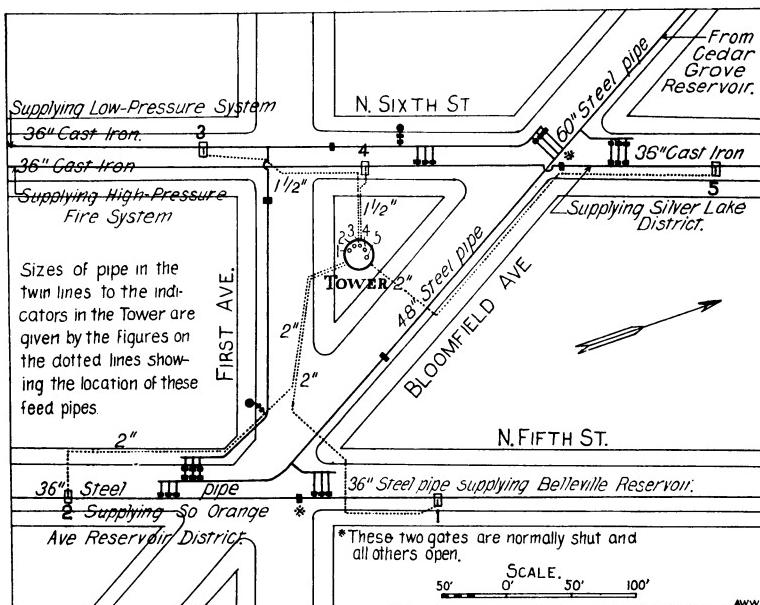


FIG. 2. PIPE CONNECTIONS AT THE TOWER

part of district 3, and a header connection with a 36-inch cast iron main supplying the high service district marked 4 on figure 3. The 60-inch steel main changes to a 48-inch riveted steel main which continues through Bloomfield Avenue to North Fifth Street. Here there is a header connection with a 36-inch riveted steel main to the Belleville reservoir supplying parts of the districts marked 1 and 3 on figure 3, a header connection to a 36-inch riveted steel pipe to the South Orange Avenue Reservoir supplying district 2 and part of district 1. The arrangement of multiple headers and gates is such

that each 36-inch main can be supplied through either or both of two headers.

The high pressure district of the city, the stippled area marked 4 in figure 3, has an independent system of distribution mains. It

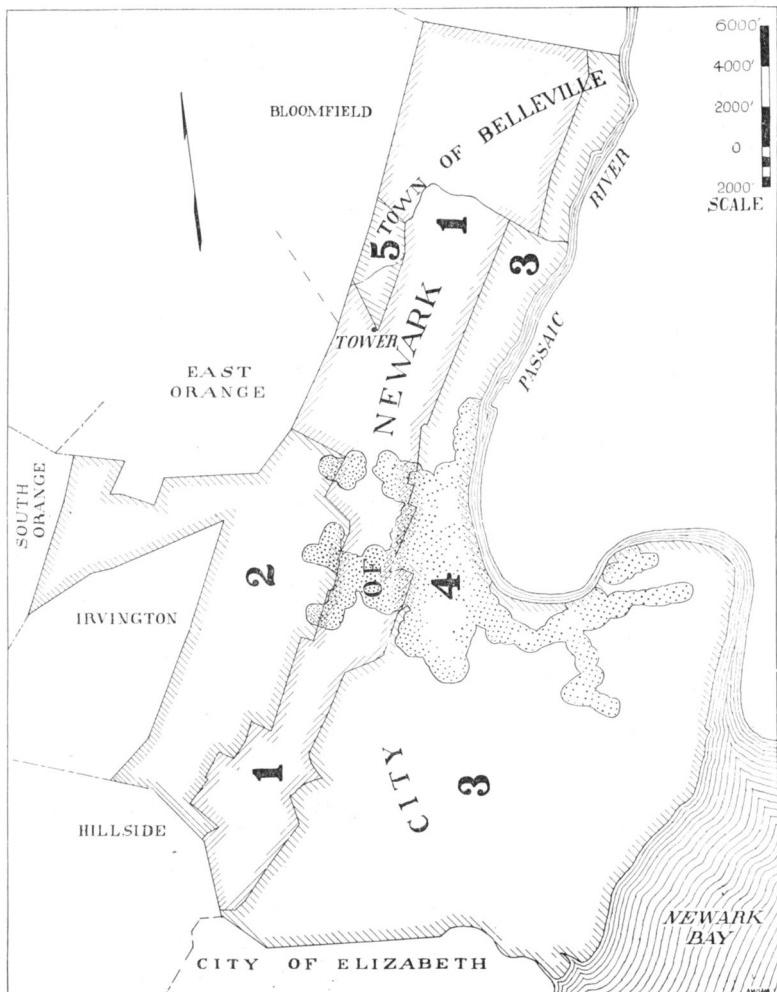


FIG. 3. SERVICE DISTRICTS OF THE NEWARK WATER WORKS

was installed for fire protection exclusively and a large part of the piping consists of heavy 20 and 12-inch cast iron mains with double-leaded joints. This system furnishes a limited amount of water for the upper floors of high buildings and a few hydraulic elevators,

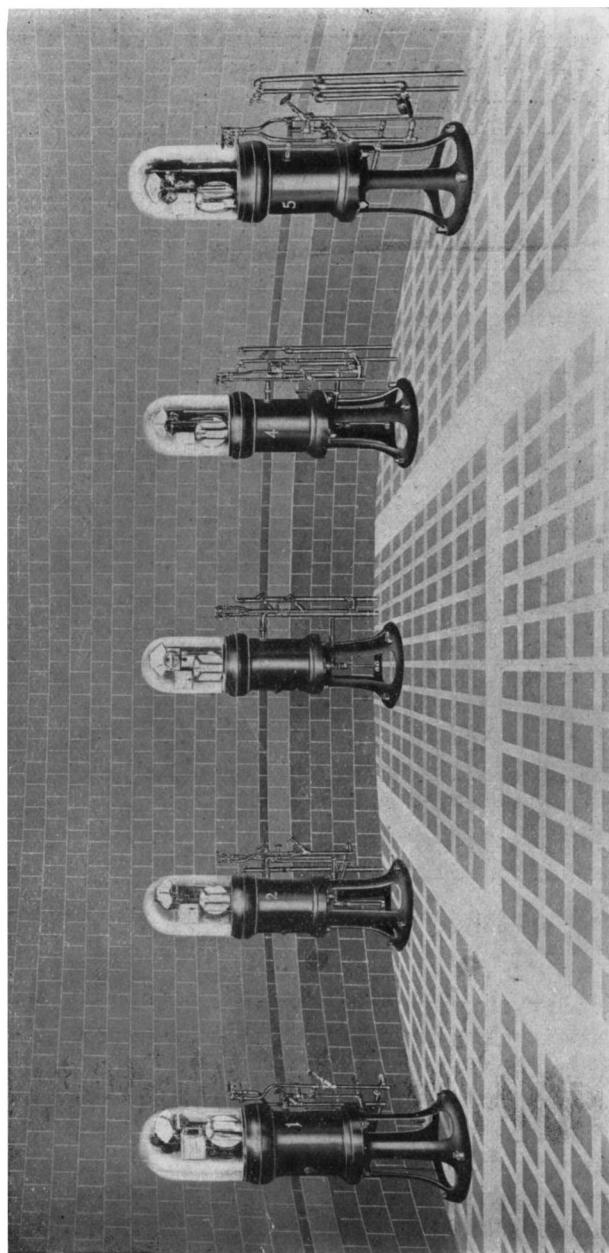


FIG. 4. METER RECORDERS IN THE MEMORIAL TOWER, NEWARK WATER WORKS

at an advance of one-third more than regular meter rates. The connections with the distribution system are made at the city hall and other points through automatic pressure regulators so designed that when the pressure on the distribution system falls below a certain amount the regulators open. In this manner normal pressure is maintained on the distribution system during fires or occasions of unusual draft without materially affecting the pressure on the high-pressure system. The distribution system is provided with

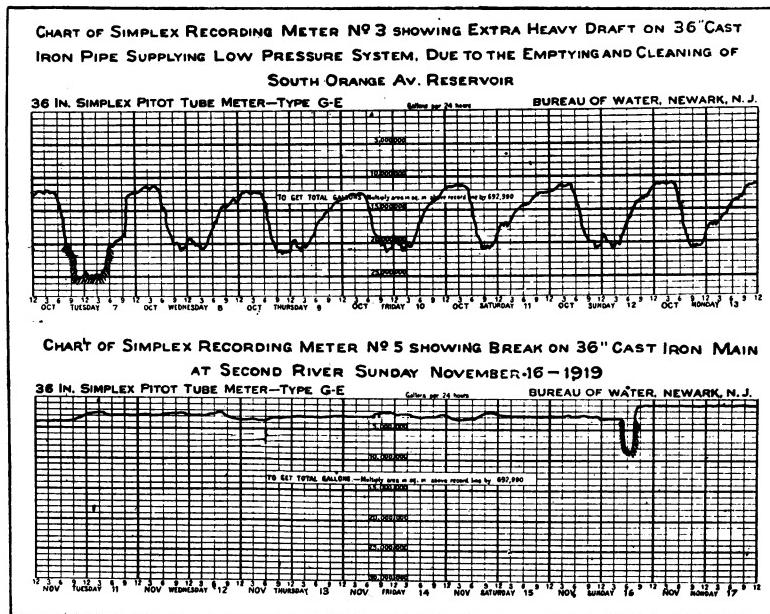


FIG. 5. CHARTS SHOWING UNUSUAL RATES OF FLOW IN MAIN DISTRIBUTION PIPES

automatic alarms to give notice of any unusual draft, and in this way the danger of an undetected depletion of the supply in the entire system is avoided.

It is evident that the little triangle of ground shown in figure 2 is the nerve center of the Newark water distribution system, and it was accordingly determined to place recording meters on all the 36-inch mains so as to obtain a permanent record of the wholesaling of water throughout the city and possess a means of detecting any unusual draft and its general location. These meters, of the Simplex

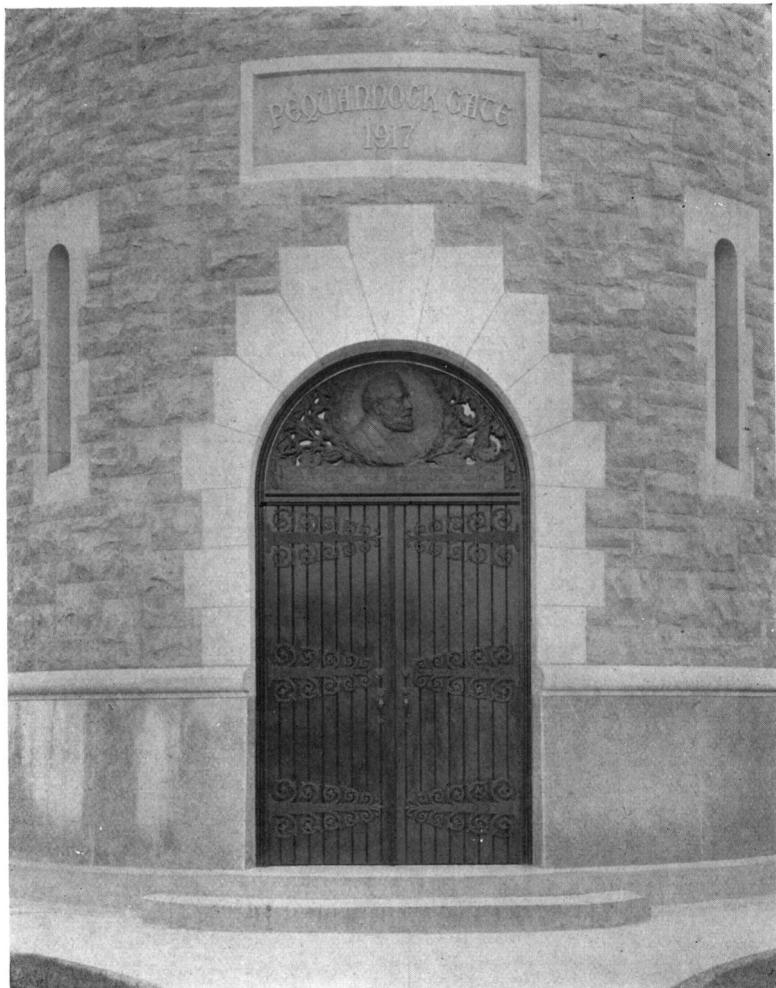


FIG. 6. HAYNES MEMORIAL DOORWAY

type, have been installed at the points shown in figure 2 and connected with the recording apparatus set up on the ground floor of the tower, figure 4. The meters have been in use but a few weeks, but it has already been found that they check the Venturi meter at Cedar Grove within a small fraction of 1 per cent.

The usefulness of this automatic record was shown a few days after it was placed in operation, as shown in the upper chart of figure 5. This was a case of heavy draft on the low-pressure system while the South Orange Avenue reservoir was emptied for cleaning.

Another interesting chart shows what happened when a break occurred on the 36-inch cast iron main in Belleville, north side of Second River, on November 15. Since this break was repaired, the diagram shows that there must have been a leak at that point for some time. In future such leak may be detected from the charts.

It was said at the beginning of these notes that the tower also served as a memorial to a prominent official of Newark. This was made possible by the location of the tower on a plot which gave an opportunity for building an architecturally attractive structure. Over the door is a bronze tablet bearing a bas relief portrait of this man, figure 6, designed by Mr. Henry H. Kitson, Lee, Mass., with the following inscription:

This building is erected to commemorate the acquisition
of the Pequannock Water Supply by the City of
Newark.

JOSEPH E. HAYNES, MAYOR
1884-1893

Through the long mayoralty of Mr. Haynes he took a very active interest in the city's water supply and was prominent in the negotiations leading up to the acquisition of the present supply. It was felt that the opportunity to commemorate permanently in this way his important services to the city many years earlier should not be neglected. The interior as well as the exterior of the building has been planned and constructed with this thought of a memorial structure in mind.

Mr. Arthur R. Denman, formerly chairman of the water department, and Mr. M. R. Sherrerd, chief engineer of the city of Newark, were primarily responsible for the erection of this memorial. The author planned the hydraulic features in connection with the tower and also designed the structure itself.